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$$\tfrac{1}{2}\pi\tan(\pi\sqrt{-1})=4\sqrt{-1}\left[\frac{1}{1+4}+\frac{1}{9+4}+\frac{1}{25+4}+\ldots\right]$$

But, $\tan(\pi\sqrt{-1})=\dfrac{\tanh\pi}{\sqrt{-1}}$; $\therefore\dfrac{1}{1+4}+\dfrac{1}{9+4}+\dfrac{1}{25+4}+\ldots=\tfrac{1}{8}\pi\tanh\pi$.

Also solved by G. B. M. Zerr, and V. M. Spunar.

306. Proposed by J. C. CORBIN, Pine Bluff, Ark.

Muir gives the following problem:

$$\text{Prove: }\begin{vmatrix}1 & a & a & a^2\\ 1 & b & b & b^2\\ 1 & c & c' & cc'\\ 1 & d & d' & dd'\end{vmatrix}=(a-b)\begin{vmatrix}1 & ab & a+b\\ 1 & cd' & c+d'\\ 1 & c'd & c'+d\end{vmatrix}$$

which, of course, can be solved by finding the terms of both determinants. Is there any method of changing from one form to the other which is direct?

Solution by J. A. CAPARO, C. E., Notre Dame University, Notre Dame, Ind.

Subtracting the first row from each one of the others:

$$\begin{vmatrix}1 & a & a & a^2\\ 0 & b-a & b-a & b^2-a^2\\ 0 & c-a & c'-a & cc'-a^2\\ 0 & d-a & d'-a & dd'-a^2\end{vmatrix}=(a-b)\begin{vmatrix}1 & 1 & b+a\\ d-a & d'-a & dd'-a^2\\ c-a & c'-a & cc'-a^2\end{vmatrix}=\triangle.$$

Multiply the first row by a and add it to the next two rows.

$$\triangle=(a-b)\begin{vmatrix}1 & 1 & b+a\\ d & d' & dd'+ba\\ c & c' & cc'+ba\end{vmatrix}=$$

$(a-b)[d'cc'+d'ba-c'dd'-c'ba-dcc'-dab+cdd'+abc+bdc'+adc'-bcd'-acd']$ which is the same as $[ab(c+d'-c'-d)+cd'(c'+d-a-b)-c'd(d'+c-a-b)]$ $\times(ab)$ or $\triangle=(a-b)[ab(c+d')-ab(c'+d)+cd'(c+d)-cd'(a+b)-c'd[d'+c)$ $+c'd(a+b)]$, which can be written

$$\triangle=(a-b)\left[\begin{vmatrix}ab & a+b\\ cd' & c+d'\end{vmatrix}-\begin{vmatrix}ab & a+b\\ c'd & c'+d\end{vmatrix}+\begin{vmatrix}cd' & c+d'\\ c'd & c'+d\end{vmatrix}\right]$$

which by Cor. 1, page 34, of Hanus' *Elements of Determinants,* is

$$\triangle=(a-b)\begin{vmatrix}1 & ab & a+b\\ 1 & cd' & c+d'\\ 1 & c'd & c'+d\end{vmatrix}.$$

Also solved by J. W. Clawson, and G. B. M. Zerr.